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| Name: Tracy Brookover and Tracie Sexton  Date: April 9, 2015 Lesson Title: Rock Cycle Inquiry  Grade Level: 3rd Grade  Length of Lesson (Minutes): 95 Minutes | | |
| **Standards** | | |
| *Science:*  **GLE 0307.Inq.3** Organize data into appropriate tables, graphs, drawings, or diagrams.  􀀹**0307.Inq.3** Maintain a science notebook that includes observations, data, diagrams, and explanations.  **GLE 0307.7.2** Recognize that rocks can be composed of one or more minerals.  􀀹**0307.7.2** Analyze the physical characteristics of different kinds of rocks.  **SPI 0307.7.2** Describe how rocks can be classified according to their physical characteristics.  *Technology:*  **Accomplishments 3.3.1.** Students will use technology tools to enhance learning, increase  productivity, and promote creativity.  c. Use the computer and technology resources as a writing tool.  *ELA:*  [**CCSS.ELA-Literacy.W.3.3**](http://www.corestandards.org/ELA-Literacy/W/3/3/)  Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.  [**CCSS.ELA-Literacy.W.3.6**](http://www.corestandards.org/ELA-Literacy/W/3/6/)  With guidance and support from adults, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others. | | |
| **Central Focus of Unit/Learning Segment** | | |
| Sedimentary rocks are formed by sediments deposited in layers by water, wind, or ice. | | |
| **Essential Understandings** | | **Essential Questions** |
| * Weathering, erosion, and deposition deposits sediments in layers. * Compaction and cementation binds sediments together to form sedimentary rock. | | * How do sedimentary rocks form in the rock cycle? |
| **Lesson Objectives** | | |
| **The learner will be able to:**   * explain how sedimentary rocks form. * describe the properties of sedimentary rocks. * identify sedimentary rocks. | | |
| **Language Demands** | | |
| **Language Function & Key Learning Task**  *Language Function:*  **Explain**  *Key Learning Task:* Students will **explain** the various processes in the formation of sedimentary rocks in their interactive notebook by drawing a diagram and writing an explanation.  **Content/Academic Vocabulary**   1. *weathering*- the process where rocks are broken down into soil. 2. *erosion*- the process by which sediment and minerals are transported from place to another by wind, water, ice or gravity. 3. *deposition* - the process in which sediment is laid down in new locations. 4. *sedimentary rock*- formed by sediments deposited in layers by water, wind, or ice. 5. *cliffs*- a high steep surface of rock 6. *compaction*- sediments formed into rock by pressure 7. *cementation* - sediments formed into rock by the bonding sediment grains by new minerals   **Discourse & Syntax**  Discourse   * Students will use discourse with their small group while they examine various sedimentary rocks. * Students will share and discuss their observations/discoveries of the starburst activity with their peers. * Students will respond orally to guided questions throughout activities and instruction.   Syntax   * Students will draw and label a diagram on the formation of sedimentary rocks.   Supports   * Physical supports used to encourage discourse and syntax provided during the lesson include: Various types of sedimentary rock, Academic Vocabulary Graphic Organizer, Sedimentary Rock ibook, and Interactive Notebooks. The choral reading of the iBook will help the struggling and english language learners. * The students will be using an interactive notebook to draw and label the sedimentary rock processes and will use a graphic organizer to write formal definitions and include drawings. * The teacher will model the correct use of the Content/Academic Vocabulary and the language function throughout the lesson. | | |
| **Materials/Resources** | | |
| **Teacher**  *Explain:*   * Smart Board * Sedimentary rocks iBook | **Students**  *For entire lesson:*   * Interactive Science Notebook per student * Pencil per student   *Engage:*   * 6 Sedimentary rocks per group of 3 students * Magnifying glass (1) per group   *Explore:*   * Five starbursts for each group of two students   *Explain:*   * iPad per student * Sedimentary rocks iBook * Vocabulary graphic organizer * Tape   *Extend:*   * iPads with Toontastic app opened per student * “Pet” sedimentary rock per student * Storyboard graphic organizer per student | |
| **References** | | |
| * **Misconceptions:** [**http://learningcenter.nsta.org/lcms/default.aspx?a=so&gid=2286&tid=680&soid=129**](http://learningcenter.nsta.org/lcms/default.aspx?a=so&gid=2286&tid=680&soid=129) * **Starburst Activity:** [**http://lemonlimeadventures.com/edible-rock-cycle-for-kids/**](http://lemonlimeadventures.com/edible-rock-cycle-for-kids/) * **Storyboard:** [**http://reflectiveleadings.blogspot.com/2010\_06\_01\_archive.html**](http://reflectiveleadings.blogspot.com/2010_06_01_archive.html) * **Multiple Intelligences for Adaptations:** Gardner, H. (2000). *Intelligence reframed: Multiple Intelligences for the 21st century.*  New York: Basic Books * **Using social interaction in learning:** Vygotsky, L.S. (1978). *Mind in Society*. *The development of higher psychological processes.* Cambridge, MA: Harvard University Press * **Probes for Rationale:** Keeley, P. (2007). *Uncovering Student Ideas in Science: 25 Formative Assessment Probes. Volume 2.* Corwin Press, NSTA Press. * **FACT Assessment:** Keeley, P. (2008). *Science Formative Assessment: 75 Practical Strategies for Linking Assessment, Instruction, and Learning.* Corwin Press, NSTA Press. | | |

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| **Adaptations to Meet Individual Needs** |
| High-Level Learners: During the “extend” portion of the lesson, students will be challenged to create a story that is more detailed scientifically about the process of how their rock was born.  On-Level Learners: The lesson as written is planned for the on-level learner.  Struggling Learners: Struggling learners will be placed in partners or groups with high-level learners who are willing to help out the struggling learner. Students will be given a printed copy of vocabulary words and content from iBook. iBook will be a choral reading which can help struggling readers with fluency and also to build confidence in reading aloud. Students will be given a printed copy of directions for explore and extend activities. For the written summative assessments, students will be given more time than the standard two minutes. For students with writing difficulties, they may use a keyboard to write their constructed response, or respond orally.  English Language Learner: Students will have the same modifications as for the struggling learner. Based on ability to respond in English, student may respond physically to the assessment. Student will be paired with a bilingual student if there is one in the class. Activities will be modeled for students. Assessment question will be simplified for these students and allowance will be made for a more simplified answer.  Other individual needs of the students/class you are teaching?:  *Visual-Spatial:* Students draw a diagram in their interactive notebook. Students will learn and interact with an iBook with the iPad as well as create a story on the iPad.  *Intrapersonal:* Students will complete their own explanations for their assessment. Students will create their own story for their pet rock as well as naming it.  *Interpersonal:* Students will work in groups and with partners.  *Bodily-Kinesthetic:* Students are physically exploring rocks and doing a hands on activity with their Starburst activity.  *Linguistic:* Students will create and write their own story. Students will read an iBook.  *Logical-Mathematical:* Students will investigate how sedimentary rocks are formed and why fossils are found in sedimentary rocks. |
| **Management/Safety Issues** |
| *Classroom Management Strategies:*  Teacher will set clearly defined expectations for behavior in the classroom, when working in groups or with a partner, during hands on activities, and iPad rules. Students will be reminded of consequences if they don’t adhere to the expectations given. Teacher will be prepared and have all necessary material ready to limit unnecessary wait time for students and to keep time flowing smoothly. Teacher will keep a timer and monitor students’ progress during activities to maintain effective time management. Teacher will give reminders to inform students of upcoming transitions in activity. |
| **Rationale/Theoretical Reasoning** |
| **Rationale**   * Younger students should be given ample opportunities to collect and examine a variety of rocks of different sizes and describe them according to their observable properties. (Keeley, 2007) * By doing the experiment with thestarbursts the students are able to visually see how sediments settle in layers then become compacted and cemented together to form sedimentary rock. This experiment allows students to acquire skills of inquiry at an observational level by making observations of the conducted experiment. Through this lesson students will gain a deeper understanding of the process it takes to make a sedimentary rock. This lesson will help them build upon previous and future knowledge about the processes of the rock cycle * Throughout grades K–12 students have many opportunities to learn about rocks, their properties, and the processes that formed them. Yet students’ conceptions of what a rock actually is may be nothing more than a memorized definition. Encourage students to develop an operational definition of a rock, and help them bridge their operational definition to a scientific one through multiple experiences. (Keeley, 2007)   **Theory**   * Students are given an opportunity to socially construct knowledge while working with their peers and are able to work in their zone of proximal development. The social interactions will also give students a chance to develop their social language. (Vygotsky, 1978) * Freyberg (1985) found that the word *rock* is used in many different ways in our com- mon language, contributing to the confusion over what a rock is geologically. Many students think rocks are of a particular size rather than characterized by what they are made of (Driver et al. 1994). (Keeley, 2007) * A study by Happs (1982) revealed that younger students often intuitively identify rocks through their weight, hardness, color, and jaggedness. Therefore, some students believe that rocks are larger, heavier, and jagged and identify smaller fragments as stones instead of rocks (Driver et al. 1994). (Keeley, 2007)     **Common Misconceptions or Difficulties**   * Many students will think that a sedimentary rock is only something that can be held in your hand such as a pebble. They will not think of sedimentary rocks as boulders or cross-bedding near a body of water. ([**http://learningcenter.nsta.org/lcms/default.aspx?a=so&gid=2286&tid=680&soid=129**](http://learningcenter.nsta.org/lcms/default.aspx?a=so&gid=2286&tid=680&soid=129)) * Students believe rocks formed where they are found because they do not understand the processes of weathering, erosion, and deposition. * Some students may think the experiment conducted is showing how metamorphic rock is formed. They may claim that the heat of our fingers and the pressure applied to the starbursts represents metamorphic change. As the teachers, we will have to explain that the way the experiment is conducted represents the layers of sedimentary rock and the compaction process. We are not distorting the starbursts, but rather keeping them in layers. * Some students may think that sedimentary rock is made up of only sand because of the grainy texture that it can have. They may not realize that sediments can include mud, sand, broken sticks/twigs, and gravel. |

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| **Assessment/Evaluation Criteria** |
| **Formative Assessment**  Assessment tools:   1. Pre-assessment-questioning from the “engage” activity- the teacher will initiate questions for student inquiry as they are examining the rocks to figure out which type of rock it is (igneous, metamorphic, sedimentary). The teacher will listen to student dialogue to assess how much they already know about sedimentary rocks. 2. Guided questioning throughout the lesson- During instruction the teacher will pause periodically to ask students questions about sedimentary rocks. By evaluating student answers, the teacher can determine whether or not students are understanding the content. From there, the teacher can decide if the lesson can go further or if specific content needs reiterated. 3. Graphic organizer foldable-The teacher will use the foldable to enhance academic vocabulary. Throughout instruction students will write the vocabulary word on the organizer, put the definition in their own words, draw a picture to represent the word, and give examples of synonyms if possible. 4. Interactive Science Notebook-students will place the graphic organizer foldable, sedimentary rock diagram, and Two Minute Paper (FACT #68) in their interactive notebooks. The teacher will review the entries, assess for understanding, and leave academic feedback. 5. Story creation with iPad app “Toontastic”- the story creation of the pet rocks will be used to assess student understanding of how rocks were not necessarily formed where they were found.   **Summative Assessment**  Assessment tool:   * (FACT #68) Two-Minute Paper. The students will be given the writing prompt: “What processes lead to the formation of sedimentary rock?” Once the prompt is given then the students have two minutes to write a constructed response in their interactive notebook. Students will then turn in their interactive notebooks to be reviewed and graded. * The students will be given a multiple choice test to check for understanding of the properties of sedimentary rock, the processes of how it formed, and identification of sedimentary rock. The students will be expected to perform at least 85% in order to achieve the mastery level.   **Academic Feedback**  I will observe the students closely and listen to their dialogue as they work together with their groups during the lesson. I will also be looking at the entries they make in their interactive notebooks which include the graphic organizer foldable, sedimentary rock diagram (starburst experiment), and Two Minute Paper (FACT #68). Guided questions will be asked throughout the lesson and I will provide assistance to any individual who is showing difficulty grasping the concept of how sedimentary rocks are formed. I will write comments directly on their foldable, sedimentary rock diagram (starburst experiment) and Two Minute Paper (FACT #68) and return it to the students. Students will be expected to use the feedback as guidance. They will be encouraged to discuss and talk about their feedback so that they can make revisions to earn a higher grade. The feedback is used to increase student progress toward the learning goal. |

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| **Instruction** | **Higher-Order Thinking Questions** |
| **Set/Hook/Motivator (Before)**  *Engage: (8 minutes) -*  Ask students to examine a group of rocks together with a magnifying glass in a small group and discuss what they observe about the rocks. (5 minutes)  Discuss with students about their observations about the rocks. Teacher leads the discussions and asks students to share their observations with the whole class. (3 minutes) | *Understanding:* How do you think these rocks formed based on your observations?  *Analyzing:* What do all of the rocks have in common? |
| **Instructional Procedures (During)**  *Explore: (7 minutes)*  Have students break up into partners and hand each of the groups 5 Starbursts in various colors that were divided before class. Tell students to unwrap their Starburst and stack them on top of each other to form a tower. Have students make a sketch of their stack of Starburst in their interactive notebook, labeling the layer colors. Instruct students to press directly down on their Starburst tower to compact the candy into one chunk. Students will sketch what the stack looks like after pressing it down. Students will also write a description of what the new chunk of Starburst looks like after they pressed down on it in their interactive notebook.  *Explain: (25 minutes)*  As a whole class, students will share their discoveries from their Starburst activities. We will discuss how we were not distorting the starbursts, but rather keeping them in layers. (5 minutes)  Next, hand students iPads and have them open iBook Author and then the Sedimentary Rocks book. Open book on Smartboard as well. Have students read the book aloud chorally. Have students click on vocabulary words and then enter those words into their vocabulary graphic organizer and then tape it into their interactive notebook when completed with all words. Discuss with students the process involved in the formation of sedimentary rocks. (15 minutes)  Students will then draw a diagram of the formation of sedimentary rocks in their interactive notebook and label the processes that are occurring. (5 minutes)  *Extend: (45 minutes)*  Students will extend their learning by creating a story in partners. Each pair of students will receive a sedimentary rock. This will be their pet rock. They will name their pet rock and create a story about the life of their rock. They will have to tell how their rock was “born” and the environment where it came from. They will have to make a story about the journey of their rock and how it came to finally end up in their possession. First they will plan out and map their story using a storyboard graphic organizer. Students will then create their story on the iPad app Toontastic. They will take a picture of their rock with the iPad and upload it into their Toontastic story. (30 minutes)  Students will share their Toontastic story with the class. (15 minutes) | *Analyzing:* What do you think the Starburst candies represent?  *Understanding:* How do you think pressing down on the Starburst candy to make them stick together in layers is similar to the formation of sedimentary rocks?  *Analyzing:*  When pressing the starburst together, we were using pressure to compact the starburst together. Why do you think rocks can be formed with pressure without needing heat?  *Analyzing:* What is the difference between weathering and erosion? Knowing now how sedimentary rock is deposited, what can you infer about why fossils are found in sedimentary rock? |
| **Closure (After)**  *Evaluate: (10 minutes)*  Have students write a Two-Minute Paper (FACT #68) in their interactive notebook. Give the students the writing prompts, “What processes lead to the formation of sedimentary rock?” Then give the students 2 minutes to write a constructed response. Students will then turn in their interactive notebooks to be reviewed and graded. (3 minutes)  Students will take a short quiz. (7 minutes) | Having students explain the process of the formation of sedimentary rocks allows the students to express what they have learned in the lesson and can be used to assess whether the objectives were met. |